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# UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No. 1-20552

First Inventor or Application Identifier Carl Joseph Kneueven

Title Sodium Bisulfate As Acidulant In Foods

Express Mail Label No. EL175179328US

140  
09/13/98  
08/10/98

APPLICATION ELEMENTS See MPEP chapter 600 concerning utility patent application contents.		ADDRESS TO: Assistant Commissioner for Patents Box Patent Application Washington, DC 20231	
1. <input checked="" type="checkbox"/> Fee Transmittal Form (e.g., PTO/SB/17) (Submit an original, and a duplicate for fee processing)	6. <input type="checkbox"/> Microfiche Computer Program (Appendix)		
2. <input checked="" type="checkbox"/> Specification (preferred arrangement set forth below) [Total Pages 17]	7. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)		
- Descriptive title of the Invention	a. <input type="checkbox"/> Computer Readable Copy		
- Cross References to Related Applications	b. <input type="checkbox"/> Paper Copy (identical to computer copy)		
- Statement Regarding Fed sponsored R & D	c. <input type="checkbox"/> Statement verifying identity of above copies		
- Reference to Microfiche Appendix			
- Background of the Invention			
- Brief Summary of the Invention			
- Brief Description of the Drawings (if filed)			
- Detailed Description			
- Claim(s)			
- Abstract of the Disclosure			
3. <input type="checkbox"/> Drawing(s) (35 U.S.C. 113) [Total Sheets 0]	ACCOMPANYING APPLICATION PARTS		
4. Oath or Declaration [Total Pages 2]	8. <input type="checkbox"/> Assignment Papers (cover sheet & document(s))		
a. <input checked="" type="checkbox"/> Newly executed (original or copy)	9. <input type="checkbox"/> 37 C.F.R. §3.73(b) Statement (when there is an assignee) <input checked="" type="checkbox"/> Power of Attorney		
b. <input type="checkbox"/> Copy from a prior application (37 C.F.R. § 1.63(d)) (for continuation/divisional with Box 17 completed) (Note Box 5 below)	10. <input type="checkbox"/> English Translation Document (if applicable)		
i. <input type="checkbox"/> DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).	11. <input type="checkbox"/> Information Disclosure Statement (IDS)/PTO-1449 <input type="checkbox"/> Copies of IDS Citations		
5. <input type="checkbox"/> Incorporation By Reference (usable if Box 4b is checked) The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered to be part of the disclosure of the accompanying application and is hereby incorporated by reference therein.	12. <input type="checkbox"/> Preliminary Amendment		
17. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment: <input type="checkbox"/> Continuation <input type="checkbox"/> Divisional <input type="checkbox"/> Continuation-in-part (CIP) of prior application No. _____ Prior application information: Examiner _____ Group / Art Unit: _____	13. <input checked="" type="checkbox"/> Return Receipt Postcard (MPEP 503) (Should be specifically itemized) * Small Entity <input type="checkbox"/> Statement filed in prior application, Status still proper and desired (PTO/SB/09-12)		
	14. <input checked="" type="checkbox"/> Statement(s) <input type="checkbox"/> Status still proper and desired (PTO/SB/09-12)		
	15. <input type="checkbox"/> Certified Copy of Priority Document(s) (if foreign priority is claimed)		
	16. <input type="checkbox"/> Other: _____		
	* A new statement is required to be entitled to pay small entity fees, except where one has been filed in a prior application and is being relied upon.		
18. CORRESPONDENCE ADDRESS			
<input type="checkbox"/> Customer Number or Bar Code Label (Insert Customer No. or Attach bar code label here)		or <input checked="" type="checkbox"/> Correspondence address below	
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**FEE TRANSMITTAL**

Patent fees are subject to annual revision on October 1.

These are the fees effective October 1, 1997.

Small Entity payments must be supported by a small entity statement, otherwise large entity fees must be paid. See Forms PTO/SB/09-12.

TOTAL AMOUNT OF PAYMENT (\$ 395.00)

**Complete If Known**

Application Number	
Filing Date	
First Named Inventor	Carl Joseph Knueven et al.
Examiner Name	
Group / Art Unit	
Attorney Docket No.	1-20552

**METHOD OF PAYMENT (check one)**

1. ☐ The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

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Number

Deposit Account Name

- ☐ Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17
- ☐ Charge the Issue Fee Set in 37 CFR 1.18 at the Mailing of the Notice of Allowance

2. ☒ Payment Enclosed:

☒ Check ☐ Money Order ☐ Other

**FEE CALCULATION****1. FILING FEE**

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
101 790	201 395	Utility filing fee	395.00
106 330	205 165	Design filing fee	
107 540	207 270	Plant filing fee	
108 790	208 395	Reissue filing fee	
114 150	214 75	Provisional filing fee	
<b>SUBTOTAL (1)</b>			<b>(\$ 395.00)</b>

**2. CLAIMS**

Total Claims	Extra	Fee from below	Fee Paid
Independent Claims 18	20** = 0	X 0	= 0.00
Multiple Dependent Claims 2	3** = 0	X 0	= 0.00

\*\*or as previously paid, if greater; For Reissues, see below

**Large Entity Small Entity**

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description
103 22	203 11	Claims in excess of 20
102 82	202 41	Independent claims in excess of 3
104 270	204 135	Multiple dependent claim, if not paid
109 82	209 41	Reissue independent claims over original patent
110 22	210 11	Reissue claims in excess of 20 and over original patent

**SUBTOTAL (2) (\$ 0.00)****FEE CALCULATION (continued)****3. ADDITIONAL FEES**

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
105 130	205 65	Surcharge - late filing fee or oath	
127 50	227 25	Surcharge - late provisional filing fee or cover sheet	
139 130	139 130	Non-English specification	
147 2,520	147 2,520	For filing a request for reexamination	
112 920*	112 920*	Requesting publication of SIR prior to Examiner action	
113 1,840*	113 1,840*	Requesting publication of SIR after Examiner action	
115 110	215 55	Extension for reply within first month	
116 400	216 200	Extension for reply within second month	
117 950	217 475	Extension for reply within third month	
118 1,510	218 755	Extension for reply within fourth month	
128 2,060	228 1,030	Extension for reply within fifth month	
119 310	219 155	Notice of Appeal	
120 310	220 155	Filing a brief in support of an appeal	
121 270	221 135	Request for oral hearing	
138 1,510	138 1,510	Petition to institute a public use proceeding	
140 110	240 55	Petition to revive - unavoidable	
141 1,320	241 660	Petition to revive - unintentional	
142 1,320	242 660	Utility issue fee (or reissue)	
143 450	243 225	Design issue fee	
144 670	244 335	Plant issue fee	
122 130	122 130	Petitions to the Commissioner	
123 50	123 50	Petitions related to provisional applications	
125 240	126 240	Submission of Information Disclosure Stmt	
581 40	581 40	Recording each patent assignment per property (times number of properties)	
146 790	246 395	Filing a submission after final rejection (37 CFR 1.129(a))	
149 790	249 395	For each additional invention to be examined (37 CFR 1.129(b))	
Other fee (specify) _____			
Other fee (specify) _____			
<b>SUBTOTAL (3)</b>			<b>(\$ 0.00)</b>

\* Reduced by Basic Filing Fee Paid

**SUBMITTED BY**

Typed or Printed Name Gary M. Sutter

Signature *Gary M. Sutter*

Date

08/10/98

**Complete (if applicable)**

Reg. Number 31,574

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TITLE: SODIUM BISULFATE AS ACIDULANT IN FOODS

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Date of signature and deposit - August 10, 1998

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TITLE  
SODIUM BISULFATE AS ACIDULANT IN FOODS

BACKGROUND OF THE INVENTION

5        This invention relates in general to acidulants for use in foods, and in particular to the use of sodium bisulfate as an acidulant in foods.

         Acidulants are acids which are added to foods to provide a variety of functions. The major functions are: to enhance the flavor of the foods by imparting a tart, sour taste; to lower pH, thus preventing the growth of bacteria  
10    which cause spoilage and food poisoning; and to chelate metal ions such as iron and copper which catalyze rancidity reactions in fats. Commonly used acidulants are citric, acetic, fumaric, ascorbic, propionic, lactic, adipic, malic, sorbic, phosphoric and tartaric acids. Most of the acidulants are organic acids.

         The known acidulants are not always totally satisfactory. For example,  
15    the organic acids are relatively weak, so that a relatively large amount of the acid must be used in the food to achieve the desired pH lowering and/or the desired sour flavor. This can undesirably increase the cost of the food, and can present other disadvantages. Some of the acidulants, such as citric acid and malic acid, are relatively expensive to begin with. Some acidulants are not very soluble in  
20    foods. Other acidulants are difficult to handle during food processing because of their corrosive nature. Accordingly, it would be desirable to provide a new acidulant for use in foods as an attractive alternative to the known acidulants.

SUMMARY OF THE INVENTION

25        This invention relates to a method for providing an acidulant effect in a food. The method comprises preparing a food including sodium bisulfate in an amount effective to act as an acidulant in the food, and further including moisture in an amount effective to dissolve the sodium bisulfate. In a preferred embodiment, the method comprises preparing a leavened baked good including

sodium bisulfate as an acidulant in the leavening system. The leavening system includes a baking carbonate and sodium bisulfate in an amount effective to react with the baking carbonate to release carbon dioxide to leaven the baked good. Preferably, the sodium bisulfate is included in an amount within a range of from about 0.1% to about 1.0% by weight of the baked good. When used in the leavening system of a baked good, preferably the sodium bisulfate is finely ground so that the particles have an average diameter within a range of from about 0.03 millimeter to about 0.2 millimeter. The invention also relates to a food composition including sodium bisulfate in an amount effective to act as an acidulant in the food, and further including moisture in an amount effective to dissolve the sodium bisulfate.

It was not previously thought to use sodium bisulfate as an acidulant in foods. Previously, sodium bisulfate was used mainly in industrial chemicals and cleaners, in metal finishing, and in other uses much different from acidulants in foods. Sodium bisulfate does not come to mind when a person thinks of acids for addition to foods. It does not have an "acid" handle on it. It is not considered in the same class of products as the known acidulants. The majority of the known acidulants are organic acids, which are common ingredients in foods, and which are often naturally occurring in foods. Sodium bisulfate is not an organic acid. Prior to this invention, sodium bisulfate had not been approved by the Food and Drug Administration for use in foods. It is believed that previous commercial sodium bisulfate products had too many impurities for use in foods. Further, it was not evident that sodium bisulfate would be desirable for use as an acidulant in foods. It is believed that sodium bisulfate is the first totally new acidulant in 20 years.

Various objects and advantages of this invention will become apparent to those skilled in the art from the following detailed description of the preferred embodiment.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The sodium bisulfate for use as an acidulant in foods according to this invention is a sodium salt of sulfuric acid generally expressed as  $\text{NaHSO}_4$  (CAS Reg. No. 7681-38-1). A preferred sodium bisulfate product is manufactured by Jones-Hamilton Co., 30354 Tracy Road, Walbridge, Ohio 43465. The Jones-Hamilton sodium bisulfate is a dry product comprising crystalline solid particles. The particles have a spherical shape with an average diameter within a range from about 0.25 millimeter to about 1 millimeter, usually about 0.74 millimeter. The product is hygroscopic and is readily soluble in water. The product can be safely handled without harm to the skin. It is significantly less expensive than many of the known acidulants.

The Jones-Hamilton sodium bisulfate is also preferred because it is a high quality product with low impurity levels. The product includes sodium bisulfate in an amount within a range of from about 91.5% to about 95.5% by weight (typically about 93%), and sodium sulfate in an amount within a range of from about 4.5% to about 8.5% by weight (typically about 7%). If the product contained less sodium bisulfate, it would not be as effective in lowering pH and imparting a sour flavor to the foods. If the product contained more sodium bisulfate, it would be too tacky and would clump up because free sulfuric acid would be present. As a result, the product would not flow well, and it would be poorly suited for use in foods such as dry mixes. (In determining the percentage of sodium bisulfate in foods according to the invention, only the actual amount of sodium bisulfate in the product is included in the calculation, while other materials such as sodium sulfate are ignored in the calculation.)

The product is also low in impurities, containing less than 0.003% heavy metals (typically less than 0.0004%), less than about 0.05% water insoluble substances (typically about 0.001%), and less than 0.003% selenium (all measured by weight percent). If the product contained more heavy metals, it would raise concerns about toxicity. If the product contained more water

insoluble substances (e.g., specks of dust and other contaminants), it would have an undesirable appearance in foods such as beverages. The product has a moisture content (measured by loss on drying) of less than 0.8% (typically about 0.2%). If the product had a higher moisture content, it would not be suited for use in a food such as a dry mix (e.g., a cake mix or a dry beverage mix). The product would not mix well with the other dry ingredients, and the high moisture could cause the sodium bisulfate to become acidic and react prematurely with the other ingredients.

The low impurities and low moisture content of the Jones-Hamilton sodium bisulfate allow it to meet Food Chemicals Codex specifications. The Food and Drug Administration recently issued a letter in which it did not question the conclusion that Jones-Hamilton's sodium bisulfate is generally recognized as safe (GRAS) as an acidulant in foods. As mentioned above, it is believed that previous commercial sodium bisulfate products had too many impurities to meet the Food Chemicals Codex specifications. Of course, the present invention is not limited to the use of the Jones-Hamilton sodium bisulfate, but rather it includes any sodium bisulfate product suitable for use in foods.

Advantageously, the use of sodium bisulfate as an acidulant in foods provides a happy medium between the use of organic acids typically used as acidulants, and the use of common inorganic acids such as sulfuric acid and hydrochloric acid. Typical organic acids are weakly acidic, having a  $pK_a$  of about 3-4. Sodium bisulfate is more strongly acidic than most organic acids, having a  $pK_a$  of 1.9. As a result, significantly less sodium bisulfate is needed than organic acid to provide a desired pH lowering and/or sour taste. However, sodium bisulfate is weakly acidic compared to the common inorganic acids, such as sulfuric acid and hydrochloric acid. The common inorganic acids, having a  $pK_a$  of less than 1, will lower pH very quickly and too much. This can cause harmful effects on the food, such as hydrolysis, flocculation, dispersion, and

color and emulsion instability, which are all strongly affected by pH. The amount of common inorganic acid necessary to produce a desired sour taste also lowers the pH too much. While sodium bisulfate can be used in conjunction with other food additives, it should not be used with hydrochloric acid or sulfuric acid because of their detrimental effect on foods. Preferably, the food includes no inorganic acids having a  $pK_a$  of less than 1.

The sodium bisulfate can be used as an acidulant in a wide variety of foods. The term "foods", as used herein, includes foods and beverages. The food uses for acidulants are well known to those skilled in the art, and include the following:

Baked goods: Acidulants are used in the leavening system of leavened baked goods, as will be discussed further below. Acidulants also are used for flavoring and for pH lowering in fruit fillings of pies and cakes.

Beverages: Acidulants are used in carbonated beverages, non-carbonated (still) beverages (e.g., fruit juice drinks and nectars), sports drinks, dietetic drinks, wines, beverage powders and gelatin desserts. The acidulants are used for flavoring and pH lowering.

Candies, confectioneries, gelatins, jellies, jams, and preserves: Acidulants are used for flavoring and pH lowering.

Canned fruits and vegetables (including juices): Acidulants are used to reduce the heating necessary for sterilization, and for flavoring.

Dairy products: Acidulants are used for flavoring and for their preservative action.

Meat and seafoods: Acidulants preserve meat and seafoods by retarding rancidity.

Fats and oils: Acidulants help to prevent rancidity and the development of off-flavors.

The sodium bisulfate is included in the food in an amount effective to act as an acidulant in the food. Usually, the sodium bisulfate is included in an



amount within a range of from about 0.01% to about 2.0% by weight of the food. The food ingredients should be thoroughly mixed so that the sodium bisulfate is uniformly distributed throughout the food.

5 The optimum particle size of the sodium bisulfate will vary depending on the type of food. Usually, the particles will have an average diameter within a range of from about 0.03 millimeter to about 1 millimeter. If desired, the sodium bisulfate can be ground or otherwise processed to reduce the particle size before incorporation into the food, by methods well known to those skilled in the art.

The sodium bisulfate is acidic only in aqueous solution. Consequently,  
10 for the sodium bisulfate to be effective as an acidulant, the food must include sufficient moisture to dissolve the sodium bisulfate. The sodium bisulfate is hygroscopic and will readily absorb moisture from the other food ingredients.

In a preferred embodiment of the invention, the sodium bisulfate is used as an acidulant in the leavening system of a baked good. As is well known to  
15 those skilled in the art, the leavening of a baked good is accomplished by liberation of carbon dioxide within the dough or batter during its preparation and in the early stages of baking. The carbon dioxide serves the purpose of lightening the baked good, giving it a finer, smoother texture and increasing its volume.

20 The leavening system includes sodium bisulfate and an alkaline substance capable of releasing carbon dioxide upon reaction with the sodium bisulfate. Usually, the alkaline substance is a baking bicarbonate, preferably an alkali metal bicarbonate, i.e., sodium bicarbonate, potassium bicarbonate, ammonium bicarbonate, calcium bicarbonate, magnesium bicarbonate, lithium bicarbonate,  
25 or a mixture thereof.

The sodium bisulfate can be used as an acidulant in the leavening system of a variety of baked goods including, for example, cakes, quick breads, muffins, biscuits, pancakes, waffles, and the like, which require the generation of carbon dioxide in order to "rise" when they are baked. Preferably, the sodium bisulfate

is included in an amount within a range of from about 0.1% to about 1.0% by weight of the baked good.

As will be described below, it has been discovered that the particle size of the sodium bisulfate is important for providing an optimum product in some baked goods. When used in the leavening system of a baked good, preferably the sodium bisulfate is finely ground so that the particles have an average diameter within a range of from about 0.03 millimeter to about 0.2 millimeter.

#### Basic Yellow Cakes

Basic yellow cakes were prepared using sodium bisulfate as the acidulant in the leavening system. Specifically, the leavening system included sodium bisulfate and sodium bicarbonate. Each of the cakes using sodium bisulfate as the acidulant was prepared as follows:

	<u>Ingredients</u>	<u>Weight</u>
	cake flour	293 grams
15	sugar (granulated)	346 grams
	sodium bisulfate	7 grams
	sodium bicarbonate	5 grams
	salt	6 grams
	milk (skim)	305 grams
20	shortening (Crisco)	75.5 grams
	water	55.9 grams
	eggs (mixed)	156 grams
	vanilla extract	3 grams

The flour, sugar, sodium bisulfate, sodium bicarbonate and salt were combined in a mixing bowl. Next, 188 grams of the milk and the shortening were added to the mixing bowl. These ingredients were mixed in a Hobart Kitchen Aid mixer at #2 speed for 2 minutes, using a paddle to aid the mixing. Then, the eggs, 117 grams of the milk, and the vanilla extract were added to the mixing bowl. The ingredients were mixed at #3 speed for 2 more minutes to

form a batter. The batter (1145 grams) was poured into a greased and floured (13 x 9 x 2-inch) pan and baked in a preheated oven at 350°F for 35 minutes.

For purposes of comparison, control cakes were prepared using baking powder as the leavening system. The baking powder contained sodium

- 5 bicarbonate, tartaric acid and cornstarch. Each of the control cakes was prepared as follows:

	<u>Ingredients</u>	<u>Weight</u>
	cake flour	293 grams
	sugar (granulated)	346 grams
10	baking powder	12 grams
	salt	6 grams
	milk (skim)	305 grams
	shortening (Crisco)	151 grams
	eggs (mixed)	156 grams
15	milk (skim)	117 grams
	vanilla extract	3 grams

- The flour, sugar, baking powder and salt were combined in a mixing bowl. Next, 188 grams of the milk and the shortening were added to the mixing bowl. These ingredients were mixed in a Hobart Kitchen Aid mixer at #2 speed for 2 minutes, using a paddle to aid the mixing. Then, the eggs, 117 grams of the milk, and the vanilla extract were added to the mixing bowl. The ingredients were mixed at #3 speed for 2 more minutes to form a batter. The batter (1145 grams) was poured into a greased and floured (13 x 9 x 2-inch) pan and baked in a preheated oven at 350°F for 35 minutes.

- 25 The cakes using sodium bisulfate as the acidulant, and the control cakes, were tasted for flavor, and were observed for height, texture, and crumb structure. Sensory testing concluded that the flavor was very good in both types of cake. The cakes using sodium bisulfate as the acidulant were found to have a lighter, cleaner and slightly citrus-like taste with no off-flavors when compared

to the control cakes. This flavor improvement was not expected beforehand. Both types of cake were of equal height, texture and crumb structure.

- The cakes using sodium bisulfate as the acidulant were prepared using both finely ground leavening components (sodium bisulfate and sodium bicarbonate) and leavening components having a larger particle size. The particles of the finely ground leavening components had an average diameter of 0.1 millimeter, while the larger particle size leavening components had an average diameter of 0.74 millimeter. The cakes prepared with finely ground leavening components produced good results in terms of surface appearance.
- The larger particle size leavening components produced black specks (sodium bisulfate) and brown surface flock (sodium bicarbonate). It was concluded that the cakes should be prepared using finely ground leavening components.

#### Frostings and Glazes

- Sodium bisulfate can be used as the acidulant in frostings and glazes. A ready-to-spread frosting is prepared as follows:

	<u>Ingredients</u>	<u>Weight %</u>
	powdered sugar	45% - 55%
	shortening	11% - 21%
	water	11% - 21%
20	corn syrup	3% - 11%
	cocoa	3% - 6%
	salt	0.1% - 1%
	potassium sorbate	0.1% - 0.3%
	sodium bisulfate	0.1% - 0.4%

- The ingredients are processed in a conventional manner to make the ready-to-spread frosting. The sodium bisulfate should be added to frostings and glazes in an amount sufficient to reduce the pH to 5.5 or below.

### Pie Fillings

Sodium bisulfate can be used as the acidulant in pie fillings. A pie filling is prepared as follows:

	<u>Ingredients</u>	<u>Weight % of Dry Mix</u>
5	sucrose	85% - 89%
	starch	7% - 11%
	sodium bisulfate	0.5% - 3%
	sodium citrate	0.5% - 3%
	color and flavor	as desired

10 The dry mix is combined with milk and/or water, and the ingredients are processed in a conventional manner to make the pie filling.

### Starch Candies

Sodium bisulfate can be used as the acidulant in starch candies. A starch candy is prepared as follows:

	<u>Ingredients</u>	<u>Weight</u>
15	sugar	0.9 - 1.1 kilograms
	corn syrup	1.0 - 1.1 kilograms
	water	1.3 - 1.5 kilograms
	cream of tartar	4 - 6 grams
20	boiling starch	0.25 - 0.28 kilogram
		in 8 kilograms of water
	sodium bisulfate	4 - 8 grams
	color and flavor	as desired

25 The ingredients are processed in a conventional manner to make the starch candy.

### Jellies and Jams

Sodium bisulfate can be used as the acidulant in jellies and jams. A grape jelly is prepared as follows:

	<u>Ingredients</u>	<u>Weight</u>
5	grape juice	0.9 - 1.1 kilograms
	citrus pectin	5 - 7 grams
	sugar	1.2 - 1.3 kilograms
	25% sodium bisulfate solution	add until pH is 3.0 - 3.2
10	The ingredients are processed in a conventional manner to make the grape jelly.	

### Gelatin Desserts

Sodium bisulfate can be used as the acidulant in gelatin desserts. A gelatin dessert is prepared as follows:

	<u>Ingredients</u>	<u>Weight % of Dry Mix</u>
15	sucrose	85 - 89%
	gelatin	8 - 10%
	sodium bisulfate	1 - 2%
	sodium citrate	0.5 - 1.5%
	color and flavor	as desired
20	The ingredients are processed in a conventional manner to make the gelatin dessert.	

### Low Calorie Salad Dressings

Sodium bisulfate can be used as the acidulant in low calorie salad dressings. A low calorie salad dressing is prepared as follows:

	<u>Ingredients</u>	<u>Weight</u>
5	powdered vinegar	15 - 20 grams
	crystalline fructose	10 - 15 grams
	salt	11 - 13 grams
	sugar	10 - 12 grams
	sweet dairy whey	11 - 13 grams
10	blend of spices	8 - 10 grams
	thickening agent	5 - 7 grams
	sodium bisulfate	3 - 5 grams
	xanthan	0.5 - 1.5 grams
	guar	0.5 - 1.5 grams
15	dehydrated parsley	0.2 - 0.4 gram
	titanium dioxide	0.2 - 0.4 gram

The ingredients are combined with 1 cup of water and 1 cup of skim milk, mixed well, and refrigerated for at least 1 hour.

### Beverages

20 Sodium bisulfate can be used as the acidulant in beverages, including still beverages, carbonated beverages, sports drinks, and dietetic drinks. A lemonade beverage is prepared from the following dry mix ingredients:

	<u>Ingredients</u>	<u>Weight</u>
	sucrose	100 - 120 grams
25	sodium bisulfate	2 - 4 grams
	calcium phosphate	1 - 2 grams
	titanium dioxide	0.2 gram
	FD&C yellow powder	0.01 gram

The dry mix ingredients are added to 1000 grams of water, and mixed until dissolved.

#### Ketchups and Barbecue Sauces

5 Sodium bisulfate can be used as the acidulant in ketchups and barbecue sauces. A ketchup is prepared by adding sodium bisulfate at 0.2% to 1.0% (by weight) of the ketchup mix to produce a pH of 3 to 4. A barbecue sauce is prepared by adding sodium bisulfate at 0.2% to 1.0% (by weight) of the barbecue sauce to produce a pH of 2 to 4.

#### Wheat and Corn Flour Tortillas

10 Sodium bisulfate can be used as the acidulant in wheat and corn flour tortillas. Antimicrobials added to tortillas to preserve freshness work most efficiently at pH 5.5 to 5.8. The sodium bisulfate is added at 0.1% to 0.5% of flour weight to produce the desired pH.

#### Canned Vegetables

15 Sodium bisulfate can be used as the acidulant in canned vegetables such as beans, beets, broccoli, cabbage, carrots, mushrooms, peas, potatoes, spinach, tomatoes and turnips. The sodium bisulfate is added in an amount sufficient to reduce the pH of the canned vegetable to 4.5 or below.

20 The principle and mode of operation of this invention have been explained in its preferred embodiments. However, it must be understood that this invention may be practiced otherwise than as specifically explained without departing from its spirit or scope.



What is claimed is:

1. A method for providing an acidulant effect in a food, the method comprising preparing a food including sodium bisulfate in an amount effective to act as an acidulant in the food, and further including moisture in an amount  
5 effective to dissolve the sodium bisulfate, but excluding sulfuric acid and hydrochloric acid.

2. The method defined in Claim 1 wherein the sodium bisulfate is included as a product comprising from about 91.5% to about 95.5% sodium  
10 bisulfate and from about 4.5% to about 8.5% sodium sulfate, by weight.

3. The method defined in Claim 1 wherein the sodium bisulfate is included as a product containing less than 0.003% heavy metals, less than 0.05% water insoluble substances, and less than 0.003% selenium, by weight.  
15

4. The method defined in Claim 1 wherein the sodium bisulfate is included as a product having a moisture content of less than 0.8%.

5. The method defined in Claim 1 wherein the method comprises  
20 preparing a leavened baked good including a baking carbonate, and sodium bisulfate in an amount effective to react with the baking carbonate to release carbon dioxide to leaven the baked good.

6. The method defined in Claim 5 wherein the sodium bisulfate is  
25 included in an amount within a range of from about 0.1% to about 1.0% by weight of the baked good.

7. The method defined in Claim 5 wherein the baked good is prepared with sodium bisulfate having particles with an average diameter within a range of from about 0.03 millimeter to about 0.2 millimeter.

8. The method defined in Claim 1 wherein the sodium bisulfate is included in an amount within a range of from about 0.01% to about 2.0% by weight of the food.

9. The method defined in Claim 1 wherein the method comprises preparing a beverage including sodium bisulfate in an amount effective to enhance the flavor of the beverage.

10. A food composition comprising a food including sodium bisulfate in an amount effective to act as an acidulant in the food, and further including moisture in an amount effective to dissolve the sodium bisulfate, but excluding sulfuric acid and hydrochloric acid.

11. The food composition defined in Claim 10 wherein the sodium bisulfate is included as a product comprising from about 91.5% to about 95.5% sodium bisulfate and from about 4.5% to about 8.5% sodium sulfate, by weight.

12. The food composition defined in Claim 10 wherein the sodium bisulfate is included as a product containing less than 0.003% heavy metals, less than 0.05% water insoluble substances, and less than 0.003% selenium, by weight.

13. The method defined in Claim 10 wherein the sodium bisulfate is included as a product having a moisture content of less than 0.8%.

14. The food composition defined in Claim 10 wherein the food is a leavened baked good including a baking carbonate, and sodium bisulfate in an amount effective to react with the baking carbonate to release carbon dioxide to leaven the baked good.

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15. The food composition defined in Claim 14 wherein the sodium bisulfate is included in an amount within a range of from about 0.1% to about 1.0% by weight of the baked good.

10

16. The food composition defined in Claim 14 wherein the sodium bisulfate comprises particles having an average diameter within a range of from about 0.03 millimeter to about 0.2 millimeter.

15

17. The food composition defined in Claim 10 wherein the sodium bisulfate is included in an amount within a range of from about 0.01% to about 2.0% by weight of the food.

20

18. The food composition defined in Claim 10 wherein the food is a beverage including sodium bisulfate in an amount effective to enhance the flavor of the beverage.

## ABSTRACT OF THE DISCLOSURE

A method for providing an acidulant effect in a food. A food is prepared including sodium bisulfate in an amount effective to act as an acidulant.

Moisture is added in an amount effective to dissolve the sodium bisulfate. In a

- 5 preferred embodiment, a leavened baked good is prepared including a baking carbonate, and sodium bisulfate in an amount effective to react with the baking carbonate to release carbon dioxide to leaven the baked good. A food composition including sodium bisulfate in an amount effective to act as an acidulant in the food, and moisture in an amount effective to dissolve the sodium
- 10 bisulfate.

Attorney Docket No. 1-20552

**COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION**

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**SODIUM BISULFATE AS ACIDULANT IN FOODS,**

the specification of which is attached hereto unless the following box is checked:

[ ] was filed on \_\_\_\_\_ as U.S. Application Number or PCT International  
Application Number \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Claimed

(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
____	____	____	____	____
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

(Application No.)	(Filing Date)
____	____
(Application No.)	(Filing Date)

I hereby claim the benefit under 35 U.S.C. §120 of any United States application(s), or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

(Application No.)	(Filing Date)	(status - patented, pending, abandoned)
____	____	____
(Application No.)	(Filing Date)	(status - patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith with full power of substitution and revocation: Richard S. MacMillan, Reg. No. 30,085; Mark J. Sobanski, Reg. No. 29,700; Oliver E. Todd, Jr., Reg. No. 24,746; Ted C. Gillespie, Reg. No. 27,981; Donald R. Fraser, Reg. No. 17,919; William J. Clemens, Reg. No. 26,855; A. Michael Tucker, Reg. No. 32,539; Gary M. Sutter, Reg. No. 31,574; John B. Molnar, Reg. No. 31,914; Douglas V. Pavelko, Reg. No. 36,888; Allen W. Inks, Reg. No. 37,358; Peter J. Rashid, Reg. No. 39,464; Thedford I. Hitafer, Reg. No. 38,490, and Scott A. Blake, Reg. No. 40,515.

Address all telephone calls to Gary M. Sutter at (419) 255-5900.

Address all correspondence to MacMillan, Sobanski & Todd, One Maritime Plaza, Fourth Floor, 720 Water Street, Toledo, Ohio 43604

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of first inventor: Carl Joseph Kneeven

Inventor's signature Carl Joseph Kneeven

Date 8/10/98

Residence: 841 S. Christopher, Bowling Green, Ohio 43402

Citizenship: U.S. Post Office Address: (Same as residence)

Full name of second inventor: Richard Alan Williams

Inventor's signature \_\_\_\_\_

Date: \_\_\_\_\_

Residence: 11865 26th Ave. North, Plymouth, Minnesota 55441

Citizenship: U.S. Post Office Address: (Same as residence)

Attorney Docket No. 1-20552

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As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

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**SODIUM BISULFATE AS ACIDULANT IN FOODS.**

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☐ I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56.

☐ I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Claimed

(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

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(Application No.)	(Filing Date)
(Application No.)	(Filing Date)

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(Application No.)	(Filing Date)	(status - patented, pending, abandoned)

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Full name of first inventor: Carl Joseph Kneueven

Inventor's signature \_\_\_\_\_

Date \_\_\_\_\_

Residence: 841 S. Christopher, Bowling Green, Ohio 43402

Citizenship: U.S. Post Office Address: (Same as residence)

Full name of second inventor: Richard Alan Williams

Inventor's signature Richard Alan Williams

Date: 8/10/98

Residence: 11865 26th Ave. North, Plymouth, Minnesota 55441

Citizenship: U.S. Post Office Address: (Same as residence)



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Attorney Docket No. 1-20552

Applicant or Patentee: Carl Joseph Knueven and Richard Alan Williams  
Serial or Patent No.: \_\_\_\_\_  
Filed or Issued: herewith  
For: Sodium Bisulfate As Acidulant In Foods

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY  
STATUS (37 CFR 1.9(f) and 1.27(c) - SMALL BUSINESS CONCERN

I hereby declare that I am

- ☐ the owner of the small business concern identified below:  
☒ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN Jones-Hamilton Co.ADDRESS OF CONCERN 30354 Tracy Road, Walbridge, Ohio 43465

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that the rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention entitled Sodium Bisulfate As Acidulant In Foods  
by inventor(s) Carl Joseph Knueven and Richard Alan Williams described in

- ☒ the specification filed herewith  
☐ application Serial No. \_\_\_\_\_, filed \_\_\_\_\_  
☐ Patent No. \_\_\_\_\_, issued \_\_\_\_\_

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING Robert GarrardTITLE OF PERSON OTHER THAN OWNER SBS Division Manager  
ADDRESS OF PERSON SIGNING 30354 Tracy Road, Walbridge, Ohio 43465SIGNATURE Robert Garrard DATE 8-10-98